

Attachment L2

Activated Carbon Injection (ACI) Cost Equations in v.2.1.6 (Part II)

Tables L2-1 and L2-2 provide a summary of the sorbent-feed concentration and cost components of ACI for mercury removal efficiencies of 90% and 60% respectively. The capital and O&M cost components shown in the table below utilize the various cost components described in the text and equations that appear in Appendix A.5.3.2 in "Documentation of EPA Modeling Applications (V.2.1) Using the Integrated Planning Model" which can be viewed and downloaded at www.epa.gov/airmarkets/epa-ipm. This is supplemented by equations designed to capture an additional operations and maintenance (O&M) cost component "Bag Replacement Costs." The equation for this cost component appears in Table L2-3 of this attachment. To calculate costs shown in Tables L2-1 and L2-2, the referenced equations are taken from Appendix A 5.3.2 and Table L2-3. For example, to derive the O&M cost for the first configuration listed in Table L2-1 (i.e., configuration 1a, which is a unit with an cold side ESP burning bituminous low sulfur coal) at the 90% ACI removal rate would require using equations 1a+2b+2c+2e+2g from Appendix A5.3.2 and new equation 1b from Table L2-3.

For a detailed discussion of the equations referenced in Tables L2-1 and L2-2, refer to section 5.3.3 and Appendix A 5.3.2 in the v.2.1 documentation report referenced above. Also, note that due to constraints on model size and run time, the 60% removal option is intended to be applied only on selected sensitivity analysis runs.

Table L2-1. Sorbent-Feed Concentration and Cost Components for 90% Mercury Removal Efficiency Using ACI

#	Coal Type	Existing Pollution Control Technology	Sulfur Grade: H-High; L-Low	Sorbent Feed 90%	CAPITAL COST COMPONENTS	O&M COST COMPONENTS
1A	Bituminous	ESP	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
2A	Bituminous	ESP/O	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
3A	Bituminous	ESP+FF	L	3	(2)+(3)	1a+2b+2c+2e+2f
4A	Bituminous	ESP+FGD	H	2	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
5A	Bituminous	ESP+FGD+SCR	H	none	none	none
6A	Bituminous	ESP+SCR	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
7A	Bituminous	FF	L	3	(2)+(3)	1a+2b+2c+2e+2f
8A	Bituminous	FF+DS	H	2	(2)+(3)	1a+2b+2c+2e+2f
9A	Bituminous	FF+FGD	H	2	(2)+(3)	1a+2b+2c+2e+2f
10A	Bituminous	HESP	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
11A	Bituminous	HESP+FGD	H	2	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
12A	Bituminous	HESP+SCR	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
13A	Bituminous	PMSCRUB+FGD	H	2	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
14A	Bituminous	PMSCRUB+FGD+SCR	H	none	none	none
1B	Bituminous	ESP	H	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
2B	Bituminous	ESP/O	H	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
3B	Bituminous	ESP+FF	H	3	(2)+(3)	1a+2b+2c+2e+2f
4B	Bituminous	ESP+FGD	L	2	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
5B	Bituminous	ESP+FGD+SCR	L	none	none	none
6B	Bituminous	ESP+SCR	H	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
7B	Bituminous	FF	H	3	(2)+(3)	1a+2b+2c+2e+2f
8B	Bituminous	FF+DS	L	2	(2)+(3)	1a+2b+2c+2e+2f
9B	Bituminous	FF+FGD	L	2	(2)+(3)	1a+2b+2c+2e+2f
10B	Bituminous	HESP	H	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
11B	Bituminous	HESP+FGD	L	2	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
12B	Bituminous	HESP+SCR	H	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
13B	Bituminous	PMSCRUB+FGD	L	2	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
14B	Bituminous	PMSCRUB+FGD+SCR	L	none	none	none
15	Lignite	ESP	L	3	(1)+(2)+(3)+(4)	1a+2a+2b+2c+2d+2e+2g+1b
16	Lignite	ESP+FF	L	3	(1)+(2)+(3)	1a+2a+2b+2c+2d+2e+2f
17	Lignite	ESP+FGD	L	3	(1)+(2)+(3)+(4)	1a+2a+2b+2c+2d+2e+2g+1b
18	Lignite	FF+DS	L	3	(1)+(2)+(3)+(4)	1a+2a+2b+2c+2d+2e+2g+1b
19	Lignite	FF+FGD	L	3	(1)+(2)+(3)	1a+2a+2b+2c+2d+2e+2f
20	Subbituminous	ESP	L	3	(2)+(3)+(4)	1a+2b+2c+2e+1b
21	Subbituminous	ESP+DS	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
22	Subbituminous	ESP+FGD	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
23	Subbituminous	ESP+SCR	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
24	Subbituminous	FF	L	3	(2)+(3)	1a+2b+2c+2e+2f
25	Subbituminous	FF+DS	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
26	Subbituminous	FF+FGD	L	3	(2)+(3)	1a+2b+2c+2e+2f
27	Subbituminous	HESP	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
28	Subbituminous	HESP+FGD	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
29	Subbituminous	HESP+SCR	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
30	Subbituminous	PMSCRUB	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b

31	Subbituminous	PMSCRUB+FGD+SCR	L	3	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
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Table L2-2. Sorbent-Feed Concentration and Cost Components for 60% Mercury Removal Efficiency Using ACI

#	Coal Type	Existing Pollution Control Technology	Sulfur Grade: H-High; L-Low	Sorbent Feed 60%	CAPITAL COST COMPONENTS	O&M COST COMPONENTS
1A	Bituminous	ESP	L	10	(2)+(3)	1a+2b+2c+2e+2f
2A	Bituminous	ESP/O	L	10	(2)+(3)	1a+2b+2c+2e+2f
3A	Bituminous	ESP+FF	L	1	(2)+(3)	1a+2b+2c+2e+2f
4A	Bituminous	ESP+FGD	H	5	(2)+(3)	1a+2b+2c+2e+2f
5A	Bituminous	ESP+FGD+SCR	H	none	None	none
6A	Bituminous	ESP+SCR	L	10	(2)+(3)	1a+2b+2c+2e+2f
7A	Bituminous	FF	L	1	(2)+(3)	1a+2b+2c+2e+2f
8A	Bituminous	FF+DS	H	1	(2)+(3)	1a+2b+2c+2e+2f
9A	Bituminous	FF+FGD	H	1	(2)+(3)	1a+2b+2c+2e+2f
10A	Bituminous	HESP	L	1	2)+(3)+(4)	1a+2b+2c+2e+2g+1b
11A	Bituminous	HESP+FGD	H	1	2)+(3)+(4)	1a+2b+2c+2e+2g+1b
12A	Bituminous	HESP+SCR	L	1	2)+(3)+(4)	1a+2b+2c+2e+2g+1b
13A	Bituminous	PMSCRUB+FGD	H	5	(2)+(3)	1a+2b+2c+2e+2f
14A	Bituminous	PMSCRUB+FGD+SCR	H	none	None	none
1B	Bituminous	ESP	H	10	(2)+(3)	1a+2b+2c+2e+2f
2B	Bituminous	ESP/O	H	10	(2)+(3)	1a+2b+2c+2e+2f
3B	Bituminous	ESP+FF	H	1	(2)+(3)	1a+2b+2c+2e+2f
4B	Bituminous	ESP+FGD	L	5	(2)+(3)	1a+2b+2c+2e+2f
5B	Bituminous	ESP+FGD+SCR	L	none	None	none
6B	Bituminous	ESP+SCR	H	10	(2)+(3)	1a+2b+2c+2e+2f
7B	Bituminous	FF	H	1	(2)+(3)	1a+2b+2c+2e+2f
8B	Bituminous	FF+DS	L	1	(2)+(3)	1a+2b+2c+2e+2f
9B	Bituminous	FF+FGD	L	1	(2)+(3)	1a+2b+2c+2e+2f
10B	Bituminous	HESP	H	1	(2)+(3)	1a+2b+2c+2e+2g+1b
11B	Bituminous	HESP+FGD	L	1	(2)+(3)	1a+2b+2c+2e+2g+1b
12B	Bituminous	HESP+SCR	H	1	(2)+(3)	1a+2b+2c+2e+2g+1b
13B	Bituminous	PMSCRUB+FGD	L	5	(2)+(3)	1a+2b+2c+2e+2f
14B	Bituminous	PMSCRUB+FGD+SCR	L	none	none	none
15	Lignite	ESP	L	10	1)+(2)+(3)	1a+2a+2b+2c+2d+2e+2f
16	Lignite	ESP+FF	L	1	1)+(2)+(3)	1a+2a+2b+2c+2d+2e+2f
17	Lignite	ESP+FGD	L	10	1)+(2)+(3)	1a+2a+2b+2c+2d+2e+2f
18	Lignite	FF+DS	L	1	(1)+(2)+(3)+(4)	1a+2a+2b+2c+2d+2e+2g+1b
19	Lignite	FF+FGD	L	1	(1)+(2)+(3)	1a+2a+2b+2c+2d+2e+2f
20	Subbituminous	ESP	L	10	(2)+(3)	1a+2b+2c+2e+2f
21	Subbituminous	ESP+DS	L	1	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
22	Subbituminous	ESP+FGD	L	10	(2)+(3)	1a+2b+2c+2e+2f
23	Subbituminous	ESP+SCR	L	1	(2)+(3)	1a+2b+2c+2e+2f
24	Subbituminous	FF	L	1	(2)+(3)	1a+2b+2c+2e+2g+1b
25	Subbituminous	FF+DS	L	1	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
26	Subbituminous	FF+FGD	L	1	(2)+(3)	1a+2b+2c+2e+2f
27	Subbituminous	HESP	L	1	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
28	Subbituminous	HESP+FGD	L	1	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
29	Subbituminous	HESP+SCR	L	1	(2)+(3)+(4)	1a+2b+2c+2e+2g+1b
30	Subbituminous	PMSCRUB	L	10	(2)+(3)	1a+2b+2c+2e+2f
31	Subbituminous	PMSCRUB+FGD+SCR	L	10	(2)+(3)	1a+2b+2c+2e+2f

Table L2-3. Additional ACI O&M Equation for Bag Replacement Costs

(1b) Bag Replacement Costs

*Bag Replacement Costs, \$ / kW-yr = 0.05 * 0.18 * PJFF BIRC*

Where,

PJFF BIRC, \$ / kW = (4) New Pulse-Jet Fabric Filter System